

INTERNATIONAL RECTIFIER



# 1N3879, 1N3889, 6FL, 12FL, 16FL SERIES

**6A, 12A and 16A Fast  
Recovery Rectifiers**

## Major Ratings and Characteristics

|                     | 1N3879<br>—1N3883 | 1N3889<br>—1N3893 | 6FL...    | 12FL... | 16FL... | Unit         |                  |
|---------------------|-------------------|-------------------|-----------|---------|---------|--------------|------------------|
| $I_F(AV)^{\dagger}$ | 6*                | 12*               | 6         | 12      | 16      | A            |                  |
| $I_{FSM}$           | 50Hz              | 72                | 145       | 110     | 145     | 180          | A                |
|                     | 60Hz              | 75*               | 150*      | 115     | 150     | 190          | A                |
| $I^2t$              | 50Hz              | 26                | 103       | 60      | 103     | 160          | A <sup>2</sup> s |
|                     | 60Hz              | 23                | 94        | 55      | 94      | 150          | A <sup>2</sup> s |
| $I_A\sqrt{t}$       | 363               | 1452              | 855       | 1452    | 2290    | A $\sqrt{s}$ |                  |
| $t_{rr}$ range      | see table         |                   |           |         |         | ns           |                  |
| $V_{RRM}$ range     | 50 — 400*         |                   | 50 — 1000 |         |         | V            |                  |
| $T_J$ range         | —65 to 150        |                   |           |         |         | °C           |                  |

\*JEDEC registered values.

† At max.  $T_C = 100^\circ\text{C}$ .

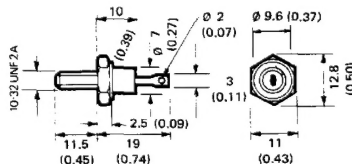
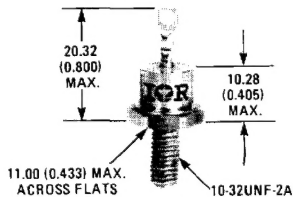
## Description

This range of fast recovery diodes is designed for applications in DC power supplies, inverters, converters, choppers, ultrasonic systems and for use as free wheel diodes.

## Features

- Short reverse recovery time
- Low stored charge
- Wide current range
- Excellent surge capabilities
- Standard JEDEC types
- Stud cathode and stud anode versions
- Types up to 1000V  $V_{RRM}$
- Fully characterised reverse recovery conditions

## CASE STYLE AND DIMENSIONS



Conforms to JEDEC: DO-203AA (DO-4)  
IEC 191-2: A3U  
BS 3934: SO-10A  
DIN 41885: 101 C 2

All dimensions in millimetres (inches)

## REVERSE VOLTAGE RATINGS

| Part Number ① ② |            |            | VRRM – Max.<br>Repetitive Peak<br>Reverse Voltage | VRRM – Max.<br>Non-Repetitive Peak<br>Reverse Voltage<br>$t_p \leq 5 \text{ ms}$ | IR – Max. Reverse Current<br>At Rated $V_R$ |                           |                           |
|-----------------|------------|------------|---|--|---|---------------------------|---------------------------|
|                 |            |            | V   | V  | $T_J = 25^\circ\text{C}$                    | $T_J = 100^\circ\text{C}$ | $T_J = 150^\circ\text{C}$ |
|                 |            |            |   |  | $I_R$ mA                                    | $I_R$ mA                  | $I_R$ mA                  |
|                 | 1N3879     |            | 50  | 75   | 0.015*                                      | 1.0*                      | 3.0*                      |
|                 | 1N3880     |            | 100   | 150  | 0.015*                                      | 1.0*                      | 3.0*                      |
|                 | 1N3881     |            | 200   | 250  | 0.015*                                      | 1.0*                      | 3.0*                      |
|                 | 1N3882     |            | 300   | 350  | 0.015*                                      | 1.0*                      | 3.0*                      |
|                 | 1N3883     |            | 400   | 450  | 0.015*                                      | 1.0*                      | 3.0*                      |
|                 | 1N3889     |            | 50  | 75   | 0.025*                                      | 3.0*                      | 5.0*                      |
|                 | 1N3890     |            | 100   | 150  | 0.025*                                      | 3.0*                      | 5.0*                      |
|                 | 1N3891     |            | 200   | 250  | 0.025*                                      | 3.0*                      | 5.0*                      |
|                 | 1N3892     |            | 300   | 350  | 0.025*                                      | 3.0*                      | 5.0*                      |
|                 | 1N3893     |            | 400   | 450  | 0.025*                                      | 3.0*                      | 5.0*                      |
| **6FL6S02       | 6FL6S05    | 6FL6S10    | 50  | 75   | 0.050                                       | —                         | 6.0                       |
| 6FL10S02        | 6FL10S05   | 6FL10S10   | 100   | 150  | 0.050                                       | —                         | 6.0                       |
| 6FL20S02        | 6FL20S05   | 6FL20S10   | 200   | 275  | 0.050                                       | —                         | 6.0                       |
| 6FL40S02        | 6FL40S05   | 6FL40S10   | 400   | 500  | 0.050                                       | —                         | 6.0                       |
| 6FL60S02        | 6FL60S05   | 6FL60S10   | 600   | 725  | 0.050                                       | —                         | 6.0                       |
| —               | 6FL80S05   | 6FL80S10   | 800   | 950  | 0.050                                       | —                         | 6.0                       |
| —               | 6FL100S05  | 6FL100S10  | 1000  | 1250   | 0.050                                       | —                         | 6.0                       |
| **12FL5S02      | 12FL5S05   | 12FL5S10   | 50  | 75   | 0.050                                       | —                         | 6.0                       |
| 12FL10S02       | 12FL10S05  | 12FL10S10  | 100   | 150  | 0.050                                       | —                         | 6.0                       |
| 12FL20S02       | 12FL20S05  | 12FL20S10  | 200   | 275  | 0.050                                       | —                         | 6.0                       |
| 12FL40S02       | 12FL40S05  | 12FL40S10  | 400   | 500  | 0.050                                       | —                         | 6.0                       |
| 12FL60S02       | 12FL60S05  | 12FL60S10  | 600   | 725  | 0.050                                       | —                         | 6.0                       |
| —               | 12FL80S05  | 12FL80S10  | 800   | 950  | 0.050                                       | —                         | 6.0                       |
| —               | 12FL100S05 | 12FL100S10 | 1000  | 1250   | 0.050                                       | —                         | 6.0                       |
| **16FL5S02      | 16FL5S05   | 16FL5S10   | 50  | 75   | 0.050                                       | —                         | 6.0                       |
| 16FL10S02       | 16FL10S05  | 16FL10S10  | 100   | 150  | 0.050                                       | —                         | 6.0                       |
| 16FL20S02       | 16FL20S05  | 16FL20S10  | 200   | 275  | 0.050                                       | —                         | 6.0                       |
| 16FL40S02       | 16FL40S05  | 16FL40S10  | 400   | 500  | 0.050                                       | —                         | 6.0                       |
| 16FL60S02       | 16FL60S05  | 16FL60S10  | 600   | 725  | 0.050                                       | —                         | 6.0                       |
| —               | 16FL80S05  | 16FL80S10  | 800   | 950  | 0.050                                       | —                         | 6.0                       |
| —               | 16FL100S05 | 16FL100S10 | 1000  | 1250   | 0.050                                       | —                         | 6.0                       |

## REVERSE RECOVERY CHARACTERISTICS

|   | 1N3879–<br>1N3883 | 1N3889–<br>1N3893 | 6FL... |      |      | 12FL... |      |      | 16FL... |      |      | Unit | Conditions   |
|---|-------------------|-------------------|--------|------|------|---------|------|------|---------|------|------|------|--|
|   |                   |                   | S02    | S05  | S10  | S02     | S05  | S10  | S02     | S05  | S10  |      |  |
| $t_{rr}$ Max. reverse recovery time                     | 150               | 150               | 110    | 285  | 490  | 100     | 250  | 430  | 90      | 225  | 390  | ns   | $T_J = 25^\circ\text{C}$ , $I_F = 1\text{A}$ to $V_R = 30\text{V}$<br>$dI_F/dt = 100\text{ A}/\mu\text{s}$           |
|   | 300*              | 300*              | 200    | 500  | 1000 | 200     | 500  | 1000 | 200     | 500  | 1000 | ns   | $T_J = 25^\circ\text{C}$ , $dI_F/dt = 25\text{ A}/\mu\text{s}$   |
| $I_{RM}(\text{REC})$ Max. peak reverse recovery current | 4*                | 5*                | —      | —    | —    | —       | —    | —    | —       | —    | —    | —    | $I_{FM} = \pi \times \text{rated } I_F(\text{AV})$   |
| QRR Max. reverse recovered charge                       | 400               | 350               | 230    | 1700 | 5000 | 200     | 1300 | 3800 | 150     | 1100 | 3000 | nC   | $T_J = 25^\circ\text{C}$ , $I_F = 1\text{A}$ to $V_R = 30\text{V}$<br>$dI_F/dt = 100\text{ A}/\mu\text{s}$           |
|   | 400               | 400               | 200    | 1200 | 5000 | 200     | 1200 | 5000 | 200     | 1200 | 5000 | nC   | $T_J = 25^\circ\text{C}$ , $dI_F/dt = 25\text{ A}/\mu\text{s}$<br>$I_{FM} = \pi \times \text{rated } I_F(\text{AV})$ |

## ELECTRICAL SPECIFICATIONS

|                    |  | 1N3879–<br>1N3883 | 6FL... | 1N3889–<br>1N3893 | 12FL... | 16FL...        | Unit   | Conditions           |   |               |  |
|--------------------|--|-------------------|--------|-------------------|---------|----------------|--|----------------------|---|---------------|--|
| FORWARD CONDUCTION |  |                   |        |                   |         |                |  |                      |   |               |  |
| $I_F(\text{AV})$   | Max. average forward current                       | 6*                | 6      | 12*               | 16      | A              | 180° conduction, half sine wave, $T_C = 100^\circ\text{C}$                     |                      |   |               |  |
| $I_F(\text{RMS})$  | Max. r.m.s. forward current                        | 9.5               | 9.5    | 19                | 25      | A              |  |                      |   |               |  |
| $I_{FSM}$          | Max. peak one-cycle non-repetitive forward current | 72                | 110    | 145               | 180     | A              | $t = 10\text{ ms}$   | With rated $V_{RRM}$ | Sinusoidal half wave, initial $T_J = 150^\circ\text{C}$ |               |  |
|                    |  | 75*               | 115    | 150*              | 190     |                | $t = 8.3\text{ ms}$  |                      |   |               |  |
|                    |  | 85                | 130    | 170               | 215     |                | $t = 10\text{ ms}$   |                      |   |               |  |
|                    |  | 90                | 135    | 180               | 225     |                | $t = 8.3\text{ ms}$  |                      |   |               |  |
| $i^2_t$            | Max. $i^2_t$ for fusing                            | 26                | 60     | 103               | 160     | $\text{A}^2$   | $t = 10\text{ ms}$   | With rated $V_{RRM}$ | Initial $T_J = 150^\circ\text{C}$                       |               |  |
|                    |  | 23                | 55     | 94                | 150     |                | $t = 8.3\text{ ms}$  |                      |   |               |  |
|                    | Max. $i^2_t$ for individual device fusing          | 36                | 86     | 145               | 230     |                | $t = 10\text{ ms}$   |                      |   | $V_{RRM} = 0$ |  |
|                    |  | 33                | 78     | 130               | 210     |                | $t = 8.3\text{ ms}$  |                      |   |               |  |
| $i^2 \sqrt{t}$     | Max. $i^2 \sqrt{t}$ for individual device fusing   | 363               | 856    | 1452              | 2290    | $i^2 \sqrt{t}$ | $t = 0.1\text{ to } 10\text{ ms}$  |                      |   |               |  |
| $V_{FM}$           | Max. peak forward voltage                          | 1.4*              | 1.4    | 1.4*              | 1.4     | V              | $T_J = 25^\circ\text{C}$ , $I_F = \text{rated } I_F(\text{AV})$ (D.C.)         |                      |   |               |  |
|                    |  | 1.5*              | 1.5    | 1.5*              | 1.5     |                | $T_C = 100^\circ\text{C}$ , $I_{FM} = \pi \times \text{rated } I_F(\text{AV})$ |                      |   |               |  |

\* JEDEC registered value

\*\* Suffix "S02" may be omitted, i.e., 12FL10 implies 12FL10S02, 12FLR60 implies 12FLR60S02.

① Types listed are cathode to case; for anode-to-case include "R" in code, i.e., 1N3879R, 6FLR20S10, 16FLR40S02.

②  $I_R(\text{AV})$  at rated  $I_F(\text{AV})$  and  $V_{RRM}$ , and  $T_C = 100^\circ\text{C}$ .③  $I_{RM}$  at rated  $V_{RRM}$  and  $T_J = 150^\circ\text{C}$ .④  $i^2_t$  for time  $t_x = i^2 \sqrt{t} \times \sqrt{x}$ 

⑤ When these devices are ordered without a suffix, e.g., 40HFL, the order will be filled with devices that meet the S02 specification.

## Thermal and mechanical specifications

|            |   |              |      | 1N3879<br>-1N3883<br>6FL... | 1N3889<br>-1N3893<br>12FL... | 16FL... | Units  | Conditions                                 |
|------------|---|--------------|------|-----------------------------|------------------------------|---------|--|--|
| $T_J$      | Junction operating temperature range                  |              |      | -65 to 150                  |                              |         | $^{\circ}\text{C}$                             |  |
| $T_{stg}$  | Storage temperature range                             |              |      | -65 to 175                  |                              |         | $^{\circ}\text{C}$                             |  |
| $R_{thJC}$ | Maximum internal thermal resistance, junction to case |              |      | 2.5                         | 2.0                          | 1.6     | deg C/W  | DC operation                               |
| $R_{thCS}$ | Maximum thermal resistance, case to heatsink          |              |      | 0.5                         |                              |         | deg C/W  | Mounting surface flat, smooth and greased. |
| T          | Mounting torque<br>$\pm 10\%$                         | to nut       | 10.5 |                             |                              | lb·in   | Lubricated threads<br>(Non-lubricated threads) |  |
|            |   |              | 0.12 |                             |                              | kgf·m   |  |  |
|            |   |              | 1.2  |                             |                              | Nm      |  |  |
|            | to device   | 11.5 (13.5)  |      |                             | lb·in                        |         |  |  |
|            |   | 0.13 (0.155) |      |                             | kgf·m                        |         |  |  |
|            |   | 1.3 (1.35)   |      |                             | Nm                           |         |  |  |
| wt         | Approximate weight                                    | 7            |      |                             | g                            |         |  |  |
|            |   | 0.25         |      |                             | oz                           |         |  |  |
|            |   | Case style   |      |                             | DO-203AA (DO-4)              |         | JEDEC  |  |

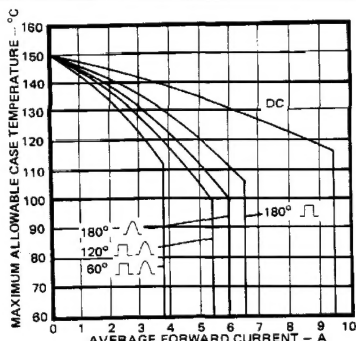


Fig. 1 - Average Forward Current Vs. Maximum Allowable Case Temperature, 1N3879 and 6FL Series

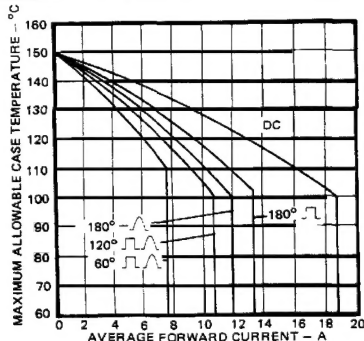


Fig. 2 - Average Forward Current Vs. Maximum Allowable Case Temperature, 1N3889 and 12FL Series

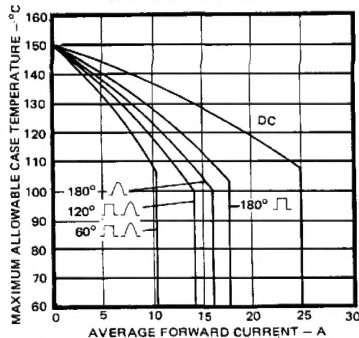
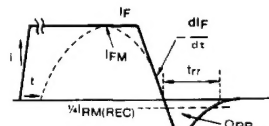


Fig. 3 - Average Forward Current Vs. Maximum Allowable Case Temperature, 16FL Series



$I_F$ ,  $I_{FM}$  = Peak forward current prior to commutation  
 $-dI_F/dt$  = Rate of fall of forward current  
 $I_{RM}(REC)$  = Peak reverse recovery current  
 $t_{rr}$  = Reverse recovery time  
 $Q_{RR}$  = Reverse recovered charge

Fig. 4 - Reverse Recovery Time Test Waveform

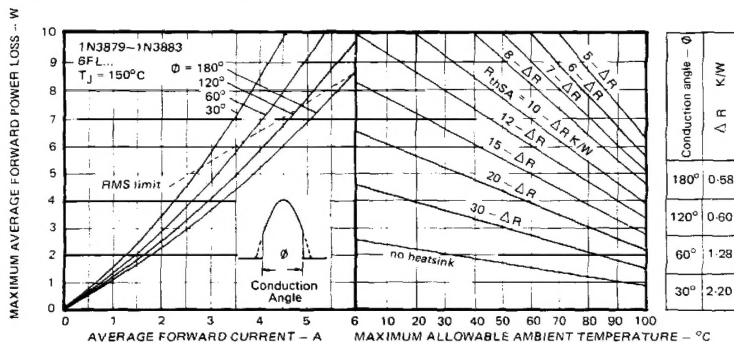


Fig. 5 - Current Rating Nomogram (Sinusoidal Waveforms), 1N3879 and 6FL Series

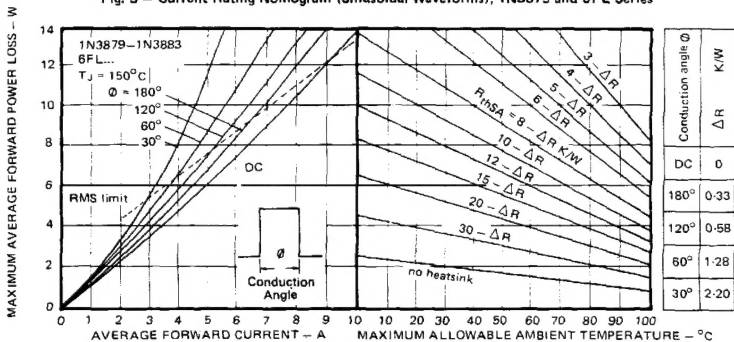


Fig. 6 - Current Rating Nomogram (Rectangular Waveforms), 1N3879 and 6FL Series

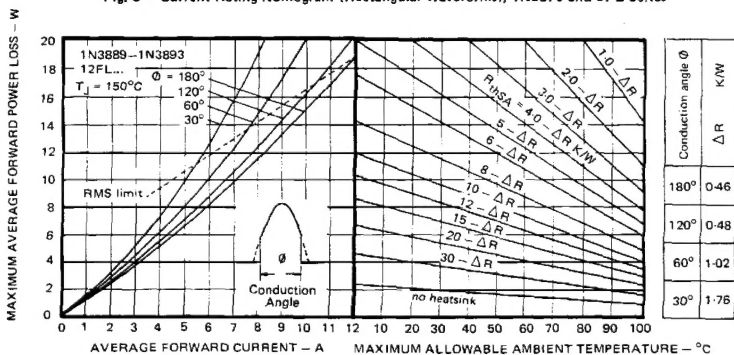
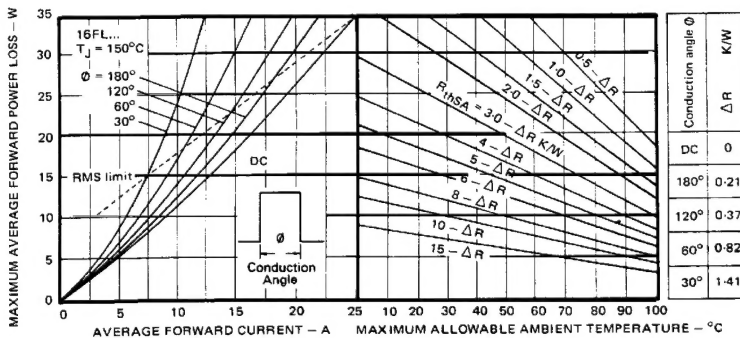
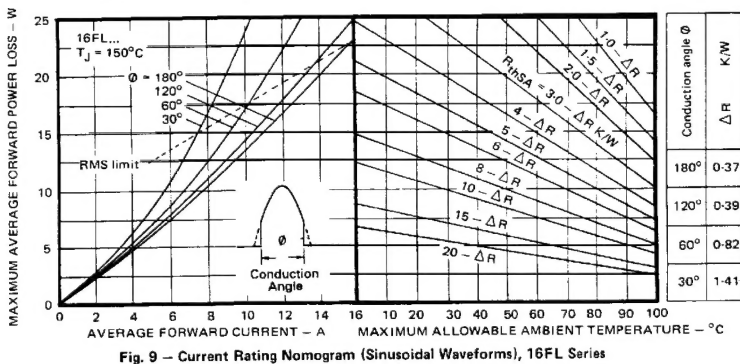
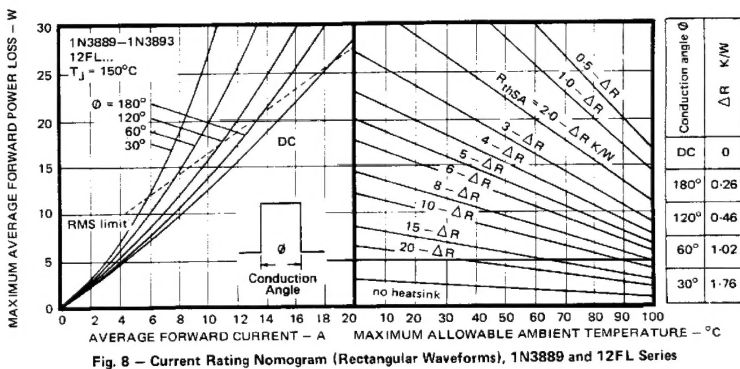


Fig. 7 - Current Rating Nomogram (Sinusoidal Waveforms), 1N3889 and 12FL Series



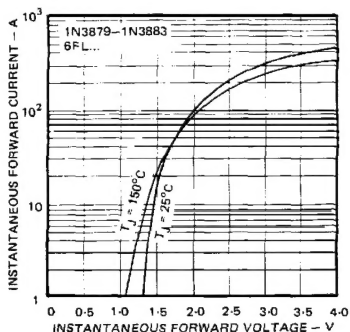


Fig. 11 - Maximum Forward Voltage Vs. Forward Current, 1N3879 and 6FL Series

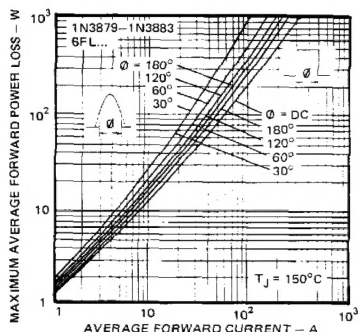


Fig. 12 - Maximum High Level Forward Power Loss Vs. Average Forward Current, 1N3879 and 6FL Series

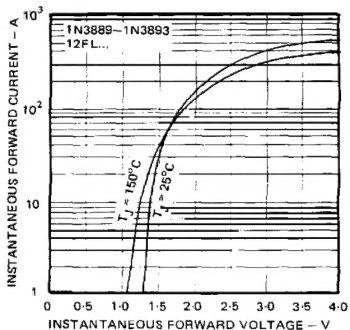


Fig. 13 - Maximum Forward Voltage Vs. Forward Current, 1N3889 and 12FL Series

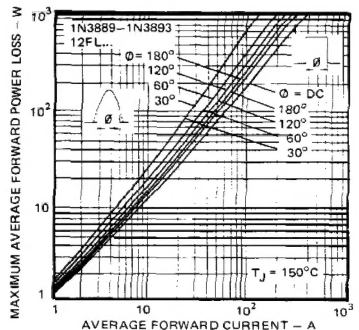


Fig. 14 - Maximum High Level Forward Power Loss Vs. Average Forward Current, 1N3889 and 12FL Series

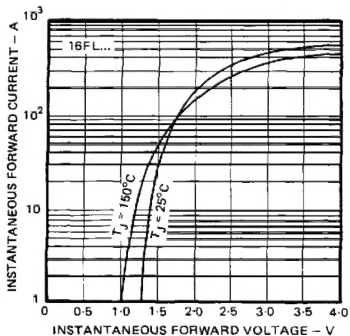


Fig. 15 - Maximum Forward Voltage Vs. Forward Current, 16FL Series

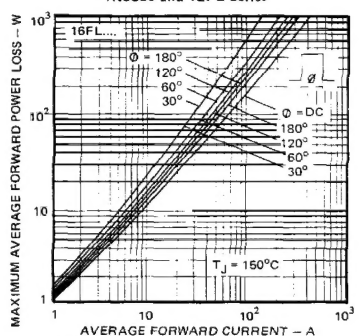


Fig. 16 - Maximum High Level Forward Power Loss Vs. Average Forward Current, 16FL Series

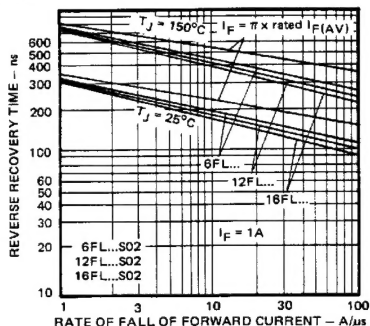


Fig. 17A - Maximum Reverse Recovery Time Vs. Rate of Fall of Forward Current, All Series \_\_S02

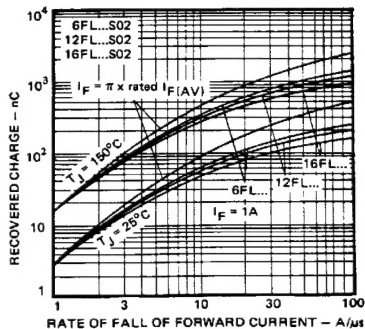


Fig. 17B - Maximum Recovered Charge Vs. Rate of Fall of Forward Current, All Series \_\_S02

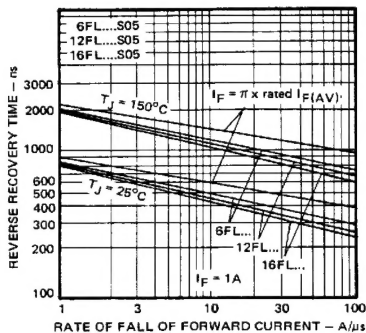


Fig. 18A - Maximum Reverse Recovery Time Vs. Rate of Fall of Forward Current, All Series \_\_S05

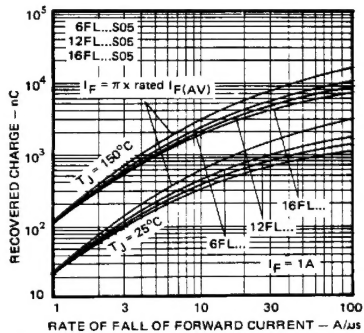


Fig. 18B - Maximum Recovered Charge Vs. Rate of Fall of Forward Current, All Series \_\_S05

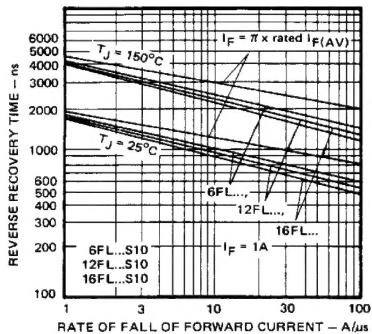


Fig. 19A - Maximum Reverse Recovery Time Vs. Rate of Fall of Forward Current, All Series \_\_S10

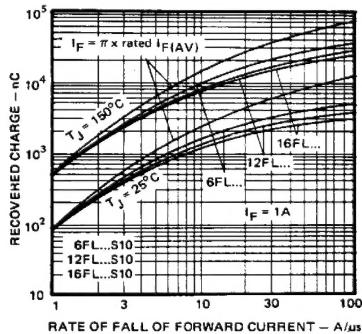


Fig. 19B - Maximum Recovered Charge Vs. Rate of Fall of Forward Current, All Series \_\_S10

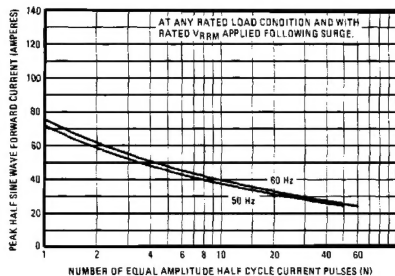


Fig. 20 - Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 1N3879 Series

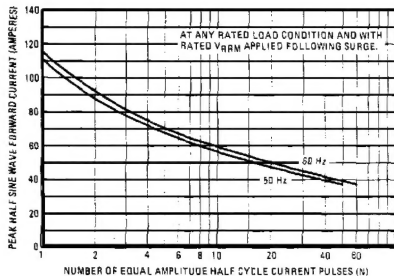


Fig. 21 - Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 6FL Series

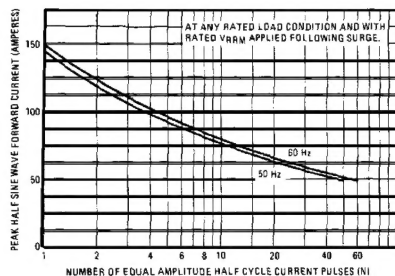


Fig. 22 - Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 1N3889 and 12FL Series

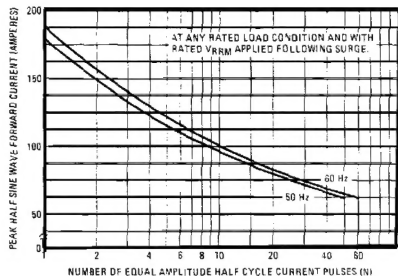


Fig. 23 - Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 16FL Series

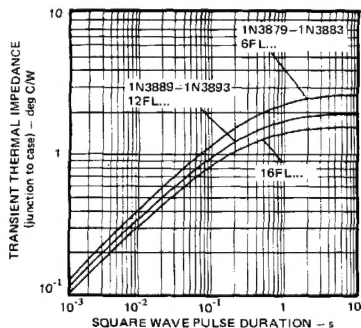


Fig. 24 - Maximum Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration, All Series.